In the matter of United States patent application no 10/749511 **(Patent Application)** in the name of Cast Centre Pty Ltd **(Applicant)**

Affidavit

I, Mahnaz Jahedi, of 1/2 Theodore Court, Toorak, Vic 3143, Australia do solemnly and sincerely declare as follows:

Qualifications and experience

1 I am the inventor of the invention the subject of the Patent Application.

2 I currently hold the position of **Cold Spray & Tooling Team Leader & Senior Principal Scientist**

3 I obtained a Degree in PhD in Metallurgy from Birmingham University of UK

4 Since qualifying in metallurgy in 1971, I have held many research and development positions in the metallurgical industry. My Curriculum Vitae is enclosed in Exhibit MJ-1.

5 The primary focus throughout my career has been developing **Coatings & Surface Engineering**

6 I am familiar with:

(a) United States patent application no 10/749511 **(Patent Application)**;

(b) United States patent 4,269,903 to Clingman et al **(US 4,269,903)**; and

(c) United States patent 4,055,705 to Stecurs and Lelbert **(US 4,055,705)**;

Background information and Interpretation of the text of the patent application

7 The function of a die coating is to reduce conductive heat transfer between the cast liquid alloy and the die, promoting filling of the die cavity. Variations in the conductive heat transfer coefficient of the die coating may be used to control the solidification rate in different regions of the die. For example, it is often desirable for the running and feeding parts of the die to have a coating with a low conductive heat transfer coefficient and in effect act as an insulator. The coating also advantageously functions to minimise thermal shock and preventing the cast alloy from soldering to the die material. The coating also serves to vent trapped air from the die cavity and, in some cases, lubricate the release of the casting from the die.

8 When designing a thermally insulating die coating for permanent mould or die components, a person of ordinary skill in the art considers the important design parameters of porosity and surface roughness (column 2, lines 1-2). The ability to increase the porosity of the die

coating enables the thermal conductivity of the die coating to be reduced, with an increased porosity of the die coating functioning as a insulator. The porous layer functions as a thermal barrier (page 5, line 21) through inhibiting heat energy extraction through the porous layer (page 5, lines 29-31). The insulating properties of the porous layer directly related to its porosity, with the rate of thermal conductivity of a material proportional to its porosity.

9 It is well understood by materials engineers that the application of a coating using a thermal spraying procedure, such as flame spraying, plasma spraying or electric arc spraying would lead to a coating with an inherently low porosity. In particular, the high temperatures reached in thermal spraying procedures results in an application of a molten liquid which flows to form a layer onto the application surface such that air entrapment is minimal.

10 In comparison to coating procedures in which the porosity of the coating is enhanced, such as the present invention, conventional thermally applied coatings would be considered to be non-porous.

11 On page 5, lines 21-23 of United States patent application no 10/749511 states:

> "The die coating provided by the invention, because of its porosity, acts as a thermal barrier. In contrast, a non-porous coating of the same material will be less effective as a thermal barrier."

Given that the present invention is directed to the creation of voids through the inclusion and subsequent removal of a polymeric material in the coating, it would be apparent to those skilled in the art that the applicant considers coatings formed by the inclusion and subsequent removal of polymeric material to be porous and coatings formed by a similar spraying technique without polymer to be considered non-porous. Hence, the skilled person is taught that the difference between the non-porous and porous layers the inclusion of the polymeric material in the coating.

Cited references

12 US 4,269,903 (*Clingman et al.,*) describes an abradable porous ceramic layer produced by codepositing zirconia, stabilized yttria, magnesia or calcium oxide with a polyester powder. After the layer is deposited onto a substrate, the substrate is heated to a temperature of about 1800°C for an appropriate period to remove the polyester powder leaving voids and a porous coating adhered to the substrate.

13 The purpose of applying the porous coating in US 4,269,903 is to provide an abradable layer to the substrate. The porous ceramic coating in US 4,269,903 does not function as a coating for a metal die or metal mould. The person skilled in the art would not be motivated by the teaching of US 4,269,903 as the key functional teaching of the reference "abradability" of the coating is a detrimental characteristic of a coating for a metal die or metal mould. As mentioned at page 4, lines 18 to 23, the abradability of the layer 7 in US 4 269,903 teaches away from its use as an abrasion resistant coating in applications such as in die coating.

14 I have read the Office Communication from the US Patent and Trademark Office dated 14 August 2006, in which the examiner has indicated that layer 3' in Figure 2 of US 4,269,903 is a porous layer. The basis for the examiner's comments is based upon the conclusion that "when a powder is thermally sprayed, air is trapped between the powders resulting in a porous layer" (item 7).

15 It is clearly apparent to the skilled addressee that the porosity of layer 3' is relatively low compared to the porosity of a layer which has added or enhanced porosity as in the present invention. Indeed, the person of ordinary skill in the art would interpret Figure 2 of US

4,269,903 as indicating that layer 7 is porous and layer 3', relative to layer 7, is non-porous. This interpretation is supported by the fact that layer 7 is labelled as a porous layer, while the layer 3' is not labelled as porous. Further, the graphical representation of layer 7 includes hollow circular marks which are presentative of voids or porosity. No such graphical representation exists for Layer 3'.

16 US 4,269,903 discloses that Layer 3' is applied using the coating technique of US 4,055,705.

17 US 4,055,705 described a thermal barrier coating system. US 4,055,705 discloses that the ceramic coating is highly reflective (column 2, line 19) and that the zirconia stabilised composition of the coatings has low thermal conductivity.

18 The coatings of US 4,055,705 are used in turbine blades and therefore are exposed to high temperature environments in which radiative energy represents a significant contribution of the total energy touching the coating is exposed. The coatings also function as a conductive barrier due to the low thermal conductivity of zirconia stabilised compositions. The coating described in US 4,055,705 acts as a thermal barrier due to the reflective ceramic surface acting as a radiative barrier.

19 The requirement in US 4,055,705 that the ceramic surface is highly reflective indicates that the porosity of the coating is inherently low. Further the coating of US 4,055,705 is not suitable to function as a coating for a metal die or mould component, as the highly reflective and hence smooth surface is detrimental to the flow of molten metal (see page 10, lines 9-15 of present application).

20 The person skilled in the art would consider that the relative porosities of Layer 3' and Layer 7 in US 4,269,903 would be equivalent to the porous and non-porous layers respectively described in the present application.

21 Within the context of the present application, Layer 3' is considered non-porous. Furthermore, I would not consider layer 3' to be porous thermal barrier layer as required in the amended claims of the present application.

Evidence in support

22 To demonstrate the differences in the thermal conductivity of a coating composition applied with enhanced or added porosity compared to inherent porosity the following test results are presented.

23 The heat transfer coefficient of a coating composition within the scope of the present invention was determined. This coating composition was labelled "Castcoat with added porosity". The heat transfer coefficient of a coating composition the same as the sampled labelled "Castcoat with added porosity", but without the initial polymer material, was also determined. This coating composition was labelled "Thermal Spray coating without polymer".

24 The methodology and results of the tests are provided in Exhibit MJ-2.

25 As illustrated in graph 1 of Exhibit MJ-2, the heat transfer coefficient of the coating with added porosity is significantly less than the heat transfers without porosity.

Sworn at

this 23 day of November 2006

Saheli
....
Signature of affiant

Before me:

David Andrew McKinley
367 Collins Street, Melbourne, Vic 3000
An Australian Legal Practitioner
within the meaning of the Legal Profession Act 2004

In the matter of United States patent application no 10/749511 (**Patent Application**) in the name of Cast Centre Pty Ltd (**Applicant**)

Exhibit

The attached is **Exhibit MJ-1** referred to in the Affidavit of Mahnaz Jahedi sworn on the 23 day of November 2006.

Signature of affiant: Jahedi

Before me:

Daniel Andrew McKinley
367 Collins Street, Melbourne, Vic 3000
An Australian Legal Practitioner
within the meaning of the Legal ~~Practice~~ Profession Act 2004

Curriculum Vitae

Dr Mahnaz Jahedi

Curriculum Vitae

Personal Details:

Name	Mahnaz Jahedi
Address	½ Theodore CRT, Toorak, Vic., 3142, Australia
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	0419 393 421 (Mobile)
Fax:	(03) 9544 11 28
E-mail Address	Mahnaz.Jahedi@csiro.au
Leisure Interests	Swjmming, bush walking and healthy life style

Profile:

I am highly motivated professional woman with solid record of accomplishment. Besides of my scientific achievements, I have high level of interpersonal skills, effective leadership and management performance records. During my educational and career development, I have always driven many research and application-orientated multi-national projects to success. I have worked in prestige research centers in countries such as UK, Germany, Sweden, Finland, Iran and Australia. I have supervised many PhD and MSc students.

Currently, I am working at CSIRO, Manufacturing Science & Technology as a Principal Research Scientist and Tooling Group Manager. I am also Aluminium Die Casting Sector leader in Co-operative Research Center (CRC) for Cast Metal Manufacturing (CAST). Aluminium Die Casting Sector has 50 researchers, four universities and several Divisions of CSIRO are involved. My role is to lead, supervise and coordinate academic, technical and financial staff in geographically diverse locations. I am committed to team based management and I am a good team player. Before joining CSIRO, I had many years of research and teaching experience.

Qualifications

1975 - 1979	**PhD in Metallurgy** **University of Birmingham, UK**
1974 –1975	**Postgraduate Diploma in Metallurgy** **University of Sheffield, UK** **Dux of Graduates**
1967 – 1971	**BSc in Metallurgy Honors Degree** **University of Tabriz, IRAN**

Recent Professional Development:

March 2001 **Management course**	Management of research organization
November 2000 **Management of Intellectual Properties II**	CSIRO course in patent application and Management of intellectual properties
September 2000 **Management of Intellectual Properties I**	CSIRO course in patent application and management of intellectual properties
October 1999 **Lotus notes training**	Using Lotus note as a communication tool
July 1996 **Harlos Management Course II**	One week course on team based management techniques developed by Gary Harlos
July 1995 **Harlos Management Course I**	One week course on budgeting, estimating and cost control

Career Achievements:

- **CSIRO Manufacturing Science & Technology and CRC for Metal Cast Manufacturing (CAST)**

Last 7 years have been the most fruitful period of my career. While I held highly regarded management positions I progressed in my scientific work too. I had 2 international patents and three provisional patents.

⇒ **New Die Coat for Low Pressure and Gravity Patent**

An invention of "New Die Coat for Low Pressure and Gravity" is in the process of commercialization. Existing die coats have very poor wear resistance and do not last long and during casting cycles needs to be "touched up". This operation is costing die casting industry a lot of money every year. New die coat is wear resistance, has no binder and also heat transfer coefficient can be tailored according the need of casting without changing the die coat thickness. We hold international patent on new die coat. The invention is in the process of commercialization. This invention can be used in mineral processing and cast houses.

⇒ **Coating Produced by Thermal Powder-Cladding Patent**

We hold international patent on coating produced by thermal powder cladding. Soldering or adhesion of aluminium to die steel is a major problem in high pressure die casting industry. This invention deposits tungsten carbide on die steel with iron matrix and then oxidizes iron. The results from other research project have demonstrated that iron oxide when is in pure magnetite form has very good soldering resistance. Nissan Casting Australia using this invention.

⇒ **Reducing soldering (adhesion of aluminum to die steel) by changing the chemistry of lubricant**

During a large research project with Nissan Casting Australia Pty Ltd., It has been found that Lubricants containing polypropylene waxes have better performance than lubricant containing polyethylene waxes. This saved Nissan Casting Australia $300,000/ year.

⇒ **Understanding of mechanism of soldering (adhesion of aluminum to die steel) in high pressure die casting of aluminium alloys**

During 3 years research project with Nissan Casting Australia, we carried out fundamental research in understanding the mechanism of soldering. The results were a great success.

- **Warman International**

⇒ **Magmasoft Modelling**

Warman International is an Australian company, doing well in international market, produces pumps for mining industry. In 1993 I established modelling facilities using **Magmasoft** for this company. The success of application of this software saved hundreds of thousands dollars for Warman International.

- **Outocompo, Finland**

⇒ **Technology transfer**

I spent a year to transfer technology to produce magnetostrictive alloys (Trefenol D) to Outocompo in Finland.

- **Fereden Pacific**

⇒ **Development of Technology to Manufacture Magnetostrictive Alloys (Terfenol D) in Industrial Scale**

It was a great opportunity to work in Uppsala University of Sweeden , Casting Research Center of Achene University of Germany and Institut fur Festkorperforschung (IFF) of Forschungzentrum of Germany.

⇒ **Development of non reactive crucible and mould material to melt and undirectionally solidify Terfenol D Alloys**

Special binder was developed to manufacture crucible and mould to be able to handle highly reactive Terfenol D melt.

Successful Manufacturing of 30 mm Diameter and 150 mm Tength of Terfenal D

⇒ The magnestrictive properties were tested and accepted by ABB of Sweden.

Employment History

Since 2002 — **Team Leader, Cold Spray & Tooling Team**
Senior Principal Research Scientist
CSIRO Manufacturing & Materials Technology

June 2002 two divisions of CSIRO were merged and the divisional management structure was changed. A team-based structure was introduced. I became **Team Leader for Cold Spray & Tooling Team.** While we maintained our research activities in tooling, we expanded tooling research from die casting to metal producing industry. We also introduce a new research area called **"Cold Spray technology".** We established **a** well-equipped Cold Spray Lab. Our equipment is the first in Australia.
Cold Spray is a revolutionary new technology and it is expected that the 70% of materials not suited to current spray technology are now candidates for use with cold spray. CSIRO (CMIT) purchased Cold Spray equipment and it is the first equipment in Australia. CMIT has well equipped with robotic system Cold Spray facilities
Cold Spray is a material deposition process in which coatings are applied by exposing a metallic or dielectric substrate to a high-velocity (300 to 1500 m/s) jet of 1- 50 μ m particles accelerated by a supersonic jet of compressed gas. The process was originally named "Cold gas-dynamic spraying" because of the relatively low temperatures (0°C to 700°C) of the expanded gas and particle stream that emanates from the nozzle.
Unlike thermal spray, Cold Spray applies metal, alloy and composite particles at temperatures much lower than the melting temperature of either the coating or substrate. As a result, Cold Spray avoids high temperature effects such as oxidation, vaporization, melting, crystallization, residual stresses, and de-bonding and gas release.

1999- 2001 — **CRC for Cast Metal Manufacturing (CAST)**
Aluminium Die Casting Sector Leader

Co-operative Research Center for cast Metal Manufacturing (CAST) research providers are CSIRO, University of Queensland, University of Monash, University of Deakin and IRIS.
This is the second run of this CRC. I was actively involved in this CRC in last 6 years. In 1999, when second run of CRC started I was appointed as **Sector Leader for Aluminum Die Casting Sector.** Aluminum die casting sector is the largest sector within CRC includes more than 50 researchers and 4 universities and 3 divisions of CSIRO. Besides of academic involvement in the projects I am very much involved in management, organizing, planning, budgeting, estimating and cost control of the sector and managing the operation in geographically diverse locations. I held this position while I was Manager for Tooling Group in CSIRO.

1995- 2002 — **Manager for Tooling Group**
Principal Research Scientist
CSIRO Manufacturing Science & Technology

Since I joined CSIRO Manufacturing Science & Technology I became Manager for Tooling Group. CSIRO Manufacturing Science & Technology has long history (27 years) continuos research in die-casting. Tooling is very important aspect of die-casting. I have led many projects with the aim of extension of die life. In this period I have supervised 4 PhD and 2 MSc students. I have lodged 3 international patents. I have got very successful career with Australian most prestige research organization. During this period I had opportunity to develop close working relationship with Australian Industry and processional organizations such as ADCA (Australian Die Casting Research Organization) and TIFA (Tooling Forum of Australia).

1993 - 1995 **Warman International**
Project Manager

Warman International is the world's leading manufacturer of high quality, rugged slurry pumps for mining, chemical and power industries. In 1991 they purchased Magmasoft. Magmasoft is sophisticated software, which simulates the casting and solidification processes and predicates where shrinkage and associated defects are likely to occur. It can be used to test design and production methods of castings, thus minimizing the need for expensive sampling procedures. Therefore, making foundries more cost effective. I was responsible for setting up this project and training foundry personnel. The project proceeded with great success and saved a lot of money for the company.

1992 – 1993 **Outokoumpo of Finland**
Consultant
Project Manager to Transfer Technology

Technology developed to manufacture Magnetostrictive Alloys (Terfenol D) was sold to Outokoumpo of Finland. I was appointed as a consultant and project manager to transfer technology to Finland. I spent one year in Pori, Finland.

1989 (January)- 1992 **Feredyn Pacific**
Project Manager
Senior Metallurgist

Feredyn Pacific was a small, high tech company located at the Technology Park in Adelaide. Feredyn was involved in developing technology to manufacture high tech materials using rare-earth metals. The giant magnetostrictive alloys in particular Terfenol D were the major interest for Feredyn. Terfenol D is an alloy of Terbium, Dysprosium and Iron (Tb_X Dy_{1-X} Fe_Y) Terfenol D was discovered in the USA in 1984. Due to its unique magnetostrictive properties, it has attracted the attention of designers and engineers.

The aim of the project I was responsible for was to develop technology to manufacture unidirectionally solidified Terfenol D rods of different diameters and lengths in industrial scales. Due to presence of rare-earth metals in Terfenol D, the melting of this alloy has to be done under vacuum and protective atmospheres. Special kind of crucible and moulds had to be developed. The other part of the project was to improve magnetostrictive properties of Terfenol D, investigate its corrosion properties and search for new magnetestrictive alloys.

In order to be able to carry out this research project I was sent to Germany and Sweden. I worked in Uppsala University, of Sweden. In Germany I worked at Institut fur Festkorperforschung (IFF) of Forschungzentrum Julisch, GmbH and Foundry Research Center, Achene University. Forschungzentrum in Julisch is one of the world well know research centers with well equipped laboratories and

I worked extensively in Forschungzentrum and Foundry Research Center, Achene University to develop technology to manufacture 30 mm diameter and 150 mm length unidirectionally solidified Terfenol D rods. ABB of Sweden tested the rods and their magnetostrictive properties were approved. The technology was sold to Finland and I was sent to transfer technology.

1986- 1988 (December) **Electricity Trust of South Australia**
Metallurgist

In 1986 I took a position as contract metallurgist in technical service department of ETSA. I was working on a research project. The main area of research was the assessment of new coal deposit as fuel for future power generation in South Australia. The south Australian coat deposit has a high level of sulfur. Corrosion tests were carried out on the samples from combustion testing of pulverized fuel in a pilot plant. Corrosion tests also were carried out in laboratory scale, simulating Fluidized Bed Combustion. I was responsible for the design of experiments investigating high temperature corrosion applicable to Fluidized Bed Combustion. I used sophisticated analytical techniques to examine the samples and determine the mechanism of corrosion.

1985 – 1986 **South Australian University of Technology**
Lecturer

In 1985, after relocated to Australia, I took on a part-time position as a lecturer with South Australian University of Technology. During this period I also carried out feasibility study on a metallurgical project for private investment.

1970 – 1984 **Tehran University**
Lecturer

In 1979, I accepted a lecturer position with the University of Techran, Department of Engineering. I lectured in Physical Metallurgy, Solidification, and Advanced Solidification Techniques for second, third and fourth year students. During this period I supervised postgraduate and final year students. I also worked closely with industry solving their problems.

3 month during 1979 **Compaire of UK**
Heat-Treatment consultant

Compare is a word well known mining machinery manufacturer. I worked for this company as a consultant in heat - treatment section solving the problems in heat - treatment of steel and nodular iron parts.

1975- 1979 **University of Birmingham**

Research Assistance

I commenced my position at the University of Birmingham as a research assistant, doing my PhD on the structure and properties of cast irons. During this period, I has the opportunity to work with Cast Iron Research Association (B.C.I.R.A.) I also had occasions to visit many industries and research institutions in UK

1971- 1974 **Machine Sazi of Tabriz (Iran)**
Quality Control Manager

Machine Sazi of Tabriz is a large, modern engineering complex in Iran, which manufactures tool machines such as, laths, pumps, electro-motors, compressors, drills, mining equipment and engineering parts.

'71 – 72'
On graduation in 1971, I commenced work with Machine Sazi of Tabriz in Central Laboratories.I Worked in metallography and mechanical Labs.

'72 – 74'
In 1972 I advanced to Quality Control Department, where I became Quality Control Manager. I was responsible for control of all products in different stages of production.

Membership of Professional Assosiations

Member of Australian Die Casting Association

Member of Tooling Forum of Australia

List of Publications:

1. M. Jahedi, D. Fraser, "Prevention of soldering in high pressure die casting using aluminium and iron oxide treatment" submitted and accepted to NADCA 21th international die casting congress & exposition, 29th of October- 2nd of November 2001.

2. D. Fraser, M. Jahedi, "Cost effective surface treatment of die casting dies to prevent soldering in high pressure die casting" submitted and accepted to IMEA 2001, 24-26 September 2001.

3. V. Ahuja, M.Jahedi, "Heat checking – a comparsion of five hot work steels to use in high pressure die casting dies" submitted and accepted to NADCA 21th international die casting congress & exposition, 29th of October- 2nd of November 2001.

4. .B. Winkelman, Z.W. Chen, D.H. StJohn, M.Z. Jahedi, "The effect of the iron content of an aluminium die casting alloy on the rate of reaction between the molten alloy and h13 die steel" submitted and accepted to NADCA 21th international die casting congress & exposition, 29th of October- 2nd of November 2001.

5. S.Gulizia, M. Jahedi, E.D. Dyle. " Performance evaluation of PVD coatings for high pressure die casting" Journal of Surface and Coating Technology 140 (2001) 200 – 205.

6. Z.W. Chen, M.Z. Jahedi, J. Law "Metallurgical phenomena in die casting interfacial regions during high pressure die of aluminium alloys" NADCA 20th international die casting congress & exposition, 1-4 November 1999, Proceeding 295-303.

7. Z.W. Chen, D. Fraser, M.Z. Jahedi "Structures of intermetallic phases formed during immersion of H13 tool steel in an Al-11Si-3Cu casting alloy melt", Materials Science and Engineering", A260 (1999) 188-196.

8. Z.W. Chen, M.Z. Jahedi, " Die erosion and its effect on soldering formation in high pressure die casting of aluminium alloys, Materials&Design 20 (1999) 303-309.

9. S. Gulizia, M.Z. Jahedi, E.D. Doyle, Z.W. Chen, " Application of Duplex Surface Treatments for Aluminium High Pressure Die Casting Tools", Proceeding of International Conference of the Tooling Industry Forum of Australia", Tooling 99, Melbourne, Australia, 1999, 205 - 211.

9. Z.W. Chen, M.Z. Jahedi. " The effect of temperature on soldering and the sequence of the formation of soldered layer during high pressure die casting of Al–11Si–3Cu alloy", International Journal of Cast Metals Research, 1998, 11, 129-138.

10. S. Gulizia, M.Z. Jahedi, D. Doyle, Z.W. Chen, " Performance evaluation of PVD coatings for high pressure die casting" Materials 98, IMEA conference. 6-8 July 1998, University of Wollongong Australia.

11. Z.W. Chen, M.Z. Jahedi, "Metallurgy of soldering in high pressure die casting of Aluminum alloys", Materials 98, IMEA conference. 6-8 July 1998, University of Wollongong Australia.

12. D.T. Fraser, M.Z. Jahedi, Z.W. Chen, "The mechanism of soldering in high pressure die casting of Aluminum alloys". proceeding of International Conference, Die Casting and Toolmaking Technology, June 22-25, 1997, Melbourne, Australia.

13. D.T. Fraser, M.Z. Jahedi, " Die lubricant in high pressure die casting" proceeding of International Conference on Die Casting and Toolmaking Technology, June 22-25, 1997, Melbourne, Australia.

14. M. Gao, C.N. Reid, M.Z. Jahedi," Effect of austenitising temperature and tempering sequence on the thermal fatigue resistance of H13 die steel" proceeding of International Conference on Die Casting and Toolmaking Technology, June 22-25, 1997, Melbourne, Australia.

15. M. Gao, C.N. Reid, M.Z. Jahedi, "Estimating equilibration times and heating / cooling rates in heat treatment of work pieces with arbitrary geometry", accepted to be published in Journal of Materials Engineering and performance, 2000.

16. Ahuja and Jahedi, "Alternative die materials - a comparison of four hot work tool steels for use in high pressure die casting dies," Materials Forum: Materials Processing, Institute of Materials Engineering Australia, Monash University, Melbourne, Australia, Nov. 1999, pp 23-28

19. Thorpe, Cleary, Ha, Stokes, Ahuja, and Jahedi, "Simulation of fluid flow

within the die cavity in high pressure die casting using smooth particle hydrodynamics," CMST Open Technical Report, 1999

20. Ahuja, M. Jahedi, "Alternative die materials - a comparison of four hot work tool steels for use in high pressure die casting dies," CAST project TO9625, report no. 99122, 1999

21. M. Giannos , M. Jahedi, R. J. Esdale, " A comparison of sodium Silicate bonded die coats with thermally sprayed coatings for permanent mould casting", ASM International Material Solution Conference, 12-15 October 1998, Rosemont, IL, USA.

22. M. Giannos , M. Jahedi, John Dernnan, "Ceramic-based die coatings used in light metal casting", Pacific rim conference, July 15-18, 1997, Carnis, Australia.

23. Ha, Ahuja and Cleary, M. Jahedi, "High pressure die casting simulation with SPH: comparison with experiment," Report no. CMIS 98/100, 5 June 1998

24. S. Gulizia, M.Z. Jahedi, E.D. Doyle and Z.W. Chen, "The relationship between draft angle and non-reactive soldering (built-up) on PVD coated core pins in HPDC", Journal paper in the process of review.

25. Z.W. Chen and M.Z. Jahedi, "Cast alloy built-up and early progression of soldered layers during HPDC of Aluminium alloys" Journal paper in the process of review.

26. M. Richardson, M.Z. Jahedi, "Suitable Refractories for Rare-Earth Metals", Proceeding of an International Conference on Rare-Earth Metals, Sydney, Australia, Octber 1993, 252-261.

27. M.Z. Jahedi, H. Wenzel "New Techniques.For the Preparation of Metallography Specimens and Cloured Metallography of Terfenol D" Journal of Forschungzentrum, Germany, March 1991.

28. M.Z. Jahedi, V. Knodic, "The Effect of Cast Structure on the Tensile Strength of Flake Graphite Cast Iron", Proceeding of an International Conference on Solidification Technology in the Foundry and Casthouse, Metal Society, Warwick, UK, 1983, 555-561.

29. M. Goreshy, M.Z. Jahedi, V. Kondic " Primary Austenite Dendrites in Gray Cast Iron", British Foundryman Journal, October 1980, 277- 281.

Most of the research projects I worked earlier were companies' properties and I was not allowed to publish.

In the matter of United States patent application no 10/749511 (**Patent Application**) in the name of Cast Centre Pty Ltd (**Applicant**)

Exhibit

The attached is **Exhibit MJ-2** referred to in the Affidavit of Mahnaz Jahedi sworn on the 23 day of November 2006.

Signature of affiant: Jahedi

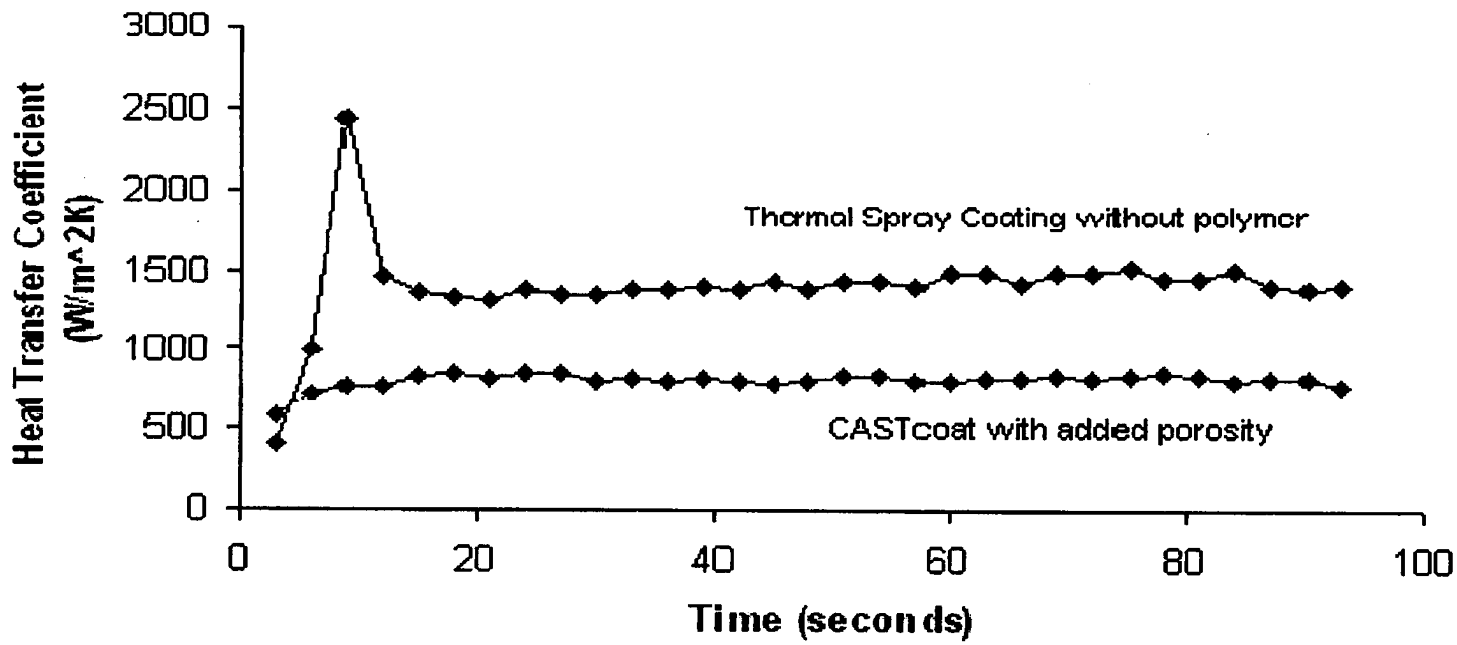
Before me: [signature]

Daniel Andrew McKinley
367 Collins Street, Melbourne, Vic 3000
An Australian Legal Practitioner within the meaning of the Legal Profession Act 2004

CASTcoat HTC methodology:

Measurement of the heat transfer co-efficient (HTC) is based on a physical test involving molten aluminium (Alloy A319) being poured onto a substrate (Hardened H13 tool steel) coated with a die coat of unknown thermal properties. This coated substrate forms the base of a thermally insulated holder, i.e. a container into which molten aluminium can be poured. The mass and temperature of the Aluminium melt are controlled so that the heat input to the system, which is thermally insulated, is known. The substrate temperature is 370°C at the time of pouring. As the system is insulated, heat flow from the aluminium into the substrate is the predominant mechanism by which the aluminium cools. Two thermocouples are positioned in the melt 3mm and 16 mm from the coating and these are used to determine thermal gradient and thermal history of the aluminium as it cools, similarly a thermocouple is located in the substrate (also 3 mm from the coating interface) to determine the thermal history and heat input from the melt. Data logging stops prior to the eutectic transformation temperature being reached.

The measured thermal history data is exported to a FEM simulation designed using the program Calcosoft-2D. The simulation is designed to conduct a reiterative inverse boundary condition calculation to determine the heat transfer coefficient of the coating. The numerical values generated by the simulation provide a means for relative comparisons to be made between different die coatings.


3000
2500
2000
1500
1000
500
0
Heat Transfer Coefficient (W/m^2K)
Thormal Spray Coating without polymor
CASTcoat with added porosity
0
20
40
60
80
100
Time (seconds)

Graph 1